

May 30, 2001

MEMORANDUM

SUBJECT: **Lindane** (009001) Reregistration Case No. 0315. Revised Anticipated Residues, Acute and Chronic Dietary Exposure and Risk Analyses for the HED Human Health Risk Assessment. DP Barcode D274825.

FROM: Thurston G. Morton, Chemist
Reregistration Branch 4
Health Effects Division (7509C)

THROUGH: David Soderberg, Chemist
Sheila Piper, Chemist
Dietary Exposure Science Advisory Council

and

Susan V. Hummel, Branch Senior Scientist
Reregistration Branch 4
Health Effects Division (7509C)

TO: Suhair Shallal, Risk Assessor
Reregistration Branch 4
Health Effects Division (7509C)

and

Mark Howard/Betty Shackleford
Reregistration Branch 3
Special Review & Reregistration Division (7508C)

Action Requested

Prepare the revised anticipated residues and acute, chronic, and cancer dietary exposure and risk analyses for lindane (009001) incorporating comments from the registrants and adding canola. Lindane [gamma isomer of benzene hexachloride] is an insecticide. Only seed treatments will be supported by the registrants

and thus, considered in these dietary exposure analyses. Cancer dietary risk will be evaluated at a later time after the mouse carcinogenicity study is reviewed.

Executive Summary

- Estimated acute dietary exposure is below HED's level of concern for all population subgroups at the 99.9th percentile. The maximum dietary risk estimate is 17 % of the acute PAD (% aPAD) for the population subgroup All Infants (Table 18) and 7 % of the aPAD for the U.S. Population when the feeding studies were adjusted using the metabolism studies.
- Estimated chronic dietary risk is below HED's level of concern. The resulting risk estimates are 3 % of the chronic PAD (% cPAD) for the U.S. Population and 11 % of the cPAD for Children 1-6 years of age (the most highly exposed population subgroup. The remaining population subgroups were <6 % of the cPAD (Table 18) when the feeding studies were adjusted using the metabolism studies.

Toxicological Information

Memoranda providing details of relevant toxicological information include the HIARC report dated 7/27/00 and the FQPA Safety Factor Committee report dated 8/2/00.

The acute and chronic FQPA safety factors of 10X were reduced to 3X (see FQPA Safety Factor Document, 8/2/00). A reference dose (RfD) which includes the FQPA safety factor (10X, 3X or 1X) is defined as the Population Adjusted Dose (PAD). Doses and endpoints for dietary risk assessment are presented in Table 1. A mouse carcinogenicity study is expected in December, 2000. The cancer dietary risk will be evaluated at that time.

Table 1. Lindane: Toxicological Doses and Endpoints for Dietary Risk Assessment.

EXPOSURE SCENARIO	DOSE (mg/kg/day)	ENDPOINT	STUDY TYPE/MRID
Acute Dietary- general population	NOAEL= 6 mg/kg UF = 100 FQPA = 3X	LOAEL is 20 mg/kg based on increased grip strength, increased Motor Activity	Acute Neurotoxicity in Rats/ 44769201
Acute RfD (Gen. Pop.) = 0.06 mg/kg/day Acute Population Adjusted Dose (aPAD) = 0.02 mg/kg/day			
Chronic Dietary	NOAEL=10 ppm (0.47 mg/kg/day) UF = 100 FQPA = 3X	LOAEL is 100 ppm (4.81 mg/kg/day) periacinar hepatocyte hypertrophy, increased liver/spleen weight, and increased platelets	Chronic Feeding and Carcinogenicity in Rats 41094101 41853701 42891201
	Chronic RfD = 0.0047 mg/kg/day Chronic Population Adjusted Dose (cPAD) = 0.0016 mg/kg/day		

¹ The Cancer Risk will be re-evaluated upon receipt of the Mouse Carcinogenicity Study in December 2000

Consumption Data

HED conducts dietary risk assessments using the Dietary Exposure Evaluation Model (DEEM™), which incorporates consumption data generated in USDA's Continuing Surveys of Food Intakes by Individuals (CSFII), 1989-1992. For acute dietary risk assessments, the entire distribution of single day food consumption events is combined with either a single residue level (deterministic analysis, risk at 95th percentile of exposure reported) or a distribution of residues (probabilistic analysis, referred to as "Monte Carlo," with risk at 99.9th percentile of exposure reported) to obtain a distribution of exposures in mg/kg/day. For chronic dietary risk assessments, the three-day average of consumption for each sub-population is combined with average residues in/on commodities to determine an average exposure in mg/kg/day.

Residue Information

Tolerances for residues of lindane in/on food and feed commodities are currently established under 40 CFR §180.133 and are expressed in terms of lindane *per se*. The nature of the residue in plants and ruminants is not adequately understood. New nature of the residue studies from seed treatment are required for a cereal grain, leafy vegetable, and radish. Additional data are required for the ruminant metabolism study. The nature of the residue in poultry is adequately understood. The HED Metabolism Assessment Review Committee (T. Morton, 8/30/00, D267069) concluded that the TRRs should be used for risk assessment

purposes and calculation of dietary burdens, pending receipt of additional metabolism data. The anticipated residues (ARs) were presented to the HED ChemSAC on 9/6/00. The ChemSAC recommended comparing the results from the dietary analysis using the TRRs with the results from a dietary analysis based on feeding studies. Exposure to lindane was determined by using the ratio (ppm TRR/ppm lindane parent). The results from the dietary analysis using the feeding study results and adjusting the lindane residues by the above ratio are the only results summarized in the Results/Discussion section. The Biological and Economic Analysis Division (OPP/BEAD) verified the registrant's percent market share estimate for lindane (I. Yusuf email, 7/17/00). The usage data are provided as Attachment 1; inclusion of the data in dietary exposure analyses is discussed below. A canola processing study for lindane was recently reviewed (T. Morton, D269388, 5/10/01). Lindane was not detected in bleached/deodorized canola oil (<0.005 ppm). Therefore, ½ LOQ (0.0025 ppm) will be used as the DEEM™ adjustment factor 1. DEEM™ default concentrations factors (adjustment factor 1) will be used for all other concentration factors. The mustard foliage TRR was translated to broccoli, Brussels sprouts, cabbage, cauliflower, radish tops, and lettuce. The wheat grain and forage TRRs were translated to barley, oats, and rye. The corn grain and forage TRRs were translated to sorghum.

The following metabolism and feeding studies were used to determine the appropriate residue values to be used in both the dietary burden calculation and the DEEM™ input files.

Seed Treatment Metabolism Study (N. Dodd, 3/24/88, RCB 3259, MRID 40431207)

Various seeds were treated with ¹⁴C lindane. Radish seeds were treated at 380 ppm (1.1x), mustard seeds at 590 ppm (0.5x for broccoli, Brussels sprouts, cabbage, and cauliflower), spinach seeds at 820 ppm (1.3x), spring wheat seeds at 370 ppm (0.3x), field corn seeds at 1800 ppm (0.8x), and sweet corn seeds at 1400 ppm (0.6x). Seeds were then planted outdoors. Samples were analyzed for radioactivity periodically by oxidative combustion and autoradiography. Samples were extracted and analyzed for ¹⁴C by liquid scintillation counting (LSC) and for lindane by gas liquid chromatography (GLC) when significant residues were found by combustion. This study was deemed inadequate due to insufficient characterization/identification of the radioactive residues. New nature of the residue studies from seed treatment are required for a cereal grain, leafy vegetable, and radish. The HED MARC (T. Morton, 8/30/00, D267069) concluded that the TRRs should be used for calculation of dietary burdens. The TRRs are summarized in the following table.

Table 2. Summary of TRR in various crops after seed treatment with ¹⁴C labeled lindane.

Crop Matrix	TRR (ppm)
Radish root	0.056
Mustard foliage	0.021
Spinach leaves	0.020
Field corn root	0.340
Field corn foliage	0.064

Field corn grain	< 0.01
Sweet corn foliage	0.051
Sweet corn grain	< 0.01
Wheat foliage	2.925
Wheat grain	0.052

The TRR used for barley, canola, oats, rye, and wheat grain was 0.052 ppm. The TRR value used for corn grain and sorghum grain was 0.01 ppm. The TRR value used for broccoli, Brussels sprouts, cabbage, cauliflower, radish tops, and lettuce was the highest TRR of mustard or spinach which was 0.021 ppm. The TRR value used for radish roots was 0.056 ppm.

Meat, Milk, Poultry, & Eggs

The following acute dietary burdens (Table 3) were calculated using the appropriate TRRs from the seed treatment metabolism study presented in the previous table (Table 2). The chronic dietary burdens (Table 4) have incorporated the percent market share of the feed item into the dietary contribution.

Table 3. Lindane Acute Dietary Burden.

Feed Commodity	% Dry Matter	% Diet	Anticipated Residue (ppm)	Dietary Contribution (ppm)
Beef Cattle				
Field corn grain	88	50	0.01	0.0057
Wheat forage	25	25	2.925	2.925
Sorghum forage	35	15	0.064	0.028
Wheat grain	89	10	0.052	0.006
Total		100		2.96
Dairy Cattle				
Field corn grain	88	40	0.01	0.0045
Wheat grain	89	10	0.052	0.006
Wheat forage	25	50	2.925	5.85
Total		100		5.86
Poultry				
Field corn grain	NA	20	0.01	0.002
Wheat grain	NA	80	0.052	0.0416
Total		100		0.044
Swine				
Field corn grain	NA	20	0.01	0.002

Wheat grain	NA	80	0.052	0.0416
Total		100		0.044

Table 4. Lindane Chronic Dietary Burden.

Feed Commodity	% Dry Matter	% Diet	Anticipated Residue (ppm)	Percent Market Share	Dietary Contribution (ppm)
Beef Cattle					
Field corn grain	88	50	0.01	0.15	0.0009
Wheat forage	25	25	2.925	0.03	0.0878
Sorghum forage	35	15	0.064	0.03	0.0008
Wheat grain	89	10	0.052	0.03	0.0002
Total		100			0.0897
Dairy Cattle					
Field corn grain	88	40	0.01	0.15	0.0007
Wheat grain	89	10	0.052	0.03	0.0002
Wheat forage	25	50	2.925	0.03	0.1755
Total		100			0.1764
Poultry					
Field corn grain	NA	20	0.01	0.15	0.0003
Wheat grain	NA	80	0.052	0.03	0.0012
Total		100			0.0015
Swine					

Field corn grain	NA	20	0.01	0.15	0.0003
Wheat grain	NA	80	0.052	0.03	0.0012
Total		100			0.0015

Ruminant Metabolism Study (MRID 44867104)

Lactating goats were orally administered ¹⁴C-Lindane capsules (via balling gun) immediately after the morning milking once per day for 7 days. The actual dose rate was 13 mg/kg. This dose rate is equivalent to approximately a 2x acute feeding rate for dairy cattle and approximately a 4.4x acute rate for beef cattle based on a dietary burden as calculated by HED. The acute anticipated residues using the TRR alone for cattle and swine are summarized in Table 6 and 7. The chronic anticipated residues using the TRR alone for cattle and swine are summarized in Table 8 and 9.

Table 5. Summary of TRR characterized/identified in tissues of lactating goats orally dosed with ¹⁴C-Lindane at 13 ppm.

Tissue	Total Radioactive Residue (TRR) ppm
Fat	3.46 ppm
Liver	2.25 ppm
Kidney	0.48 ppm
Muscle	0.20 ppm
Milk Fat	0.136 ppm

Table 6. Cattle Acute Anticipated Residues From Nature of the residue study (M. Kovacs Jr., 9/20/88, RCB 4037).

Tissue	13 ppm Feeding Level (4.4X) ^a	Cattle AR
Fat	3.46/4.4=0.786	0.786 ppm
Muscle	0.2/4.4=0.045	0.045 ppm
Milk Fat	0.136/2=0.068	0.068 ppm
Liver	2.25/4.4=0.511	0.511 ppm ^b
Kidney	0.48/4.4=0.109	0.109 ppm

^a The 13 ppm feeding level represented 2x the dairy dietary burden.

^b Use for liver, meat byproducts, and other organ meats for beef, goat, horses, sheep, and veal.

Table 7. Swine Acute Anticipated Residues based on metabolism data from the ruminant metabolism study.

Tissue	13 ppm Feeding Level (295X)	Swine AR
Fat	$3.46/295=0.012$	0.012 ppm
Muscle	$0.2/295=0.001$	0.001 ppm
Liver	$2.25/295=0.008$	0.008 ppm ^a
Kidney	$0.48/295=0.002$	0.002 ppm

^a Use for liver, meat byproducts, and other organ meats for pork.

Table 8. Cattle Chronic Anticipated Residues From Nature of the residue study (M. Kovacs Jr., 9/20/88, RCB 4037).

Tissue	13 ppm Feeding Level (145X) ^a	Cattle AR
Fat	$3.46/145=0.02$	0.02 ppm
Muscle	$0.2/145=0.001$	0.001 ppm
Milk Fat	$0.136/74=0.002$	0.002 ppm
Liver	$2.25/145=0.02$	0.02 ppm ^b
Kidney	$0.48/145=0.003$	0.003 ppm

^a The 13 ppm feeding level represented 74x the chronic dairy dietary burden.

^b Use for liver, meat byproducts, and other organ meats for beef, goat, horses, sheep, and veal.

Table 9. Swine Chronic Anticipated Residues based on metabolism data from the ruminant metabolism study.

Tissue	13 ppm Feeding Level (8700X)	Swine AR
Fat	$3.46/8700=0.0004$	0.0004 ppm
Muscle	$0.2/8700=0.00002$	0.00002 ppm
Liver	$2.25/8700=0.0003$	0.0003 ppm ^a
Kidney	$0.48/8700=0.00006$	0.00006 ppm

^a Use for liver, meat byproducts, and other organ meats for pork.

Poultry Metabolism Study (MRID 40271301)

Following 4 days of dosing with [¹⁴C]lindane at levels equivalent to 120 (2700x) ppm in the acute diet, ¹⁴C-residues accumulated to the greatest extent in fatty tissues. In the high-dose hens, TRRs were highest in fat (96.98 ppm) followed by skin (49.93 ppm), thigh muscle (11.81 ppm), liver (11.65 ppm), and breast muscle (1.44 ppm).

¹⁴C-Residues were readily extracted (80-141% TRR) from yolks, thigh muscle, liver, skin, and fat of high-dose hens using organic solvents, and 66.4-121.3% of the TRR was subsequently identified. Lindane was the principal ¹⁴C-residue identified in eggs and tissues, accounting for 94.5% of the TRR in egg yolks, 70.8-86.0% of the TRR in muscle, skin, and fat, and 51.5% of the TRR in liver. 1,2,4-Trichlorobenzene was identified as accounting for 19.4% of the TRR in liver, and 0.6-3.5% of the TRR in egg yolks and other tissues. 1,3,5-Trichlorobenzene and dichlorobenzene(s) were also detected in liver at 6.4 and 9.5% of the TRR, respectively. Tetrachlorobenzene (either 1,2,4,5- or 1,2,3,4-) was detected in thigh muscle at 17.7% of the TRR and in other tissues at 2.2-3.1% of the TRR. Pentachlorocyclohexene was identified as accounting for 3.8-6.1% of the TRR in yolks and tissues. The remaining metabolites (1,2,3,4-tetrachlorobenzene/tetrachlorocyclohexene; 1,2,3,4,5-pentachlorobenzene; and hexachlorocyclohexene) detected in tissues and/or yolks each accounted for #4.4% of the TRR. The acute anticipated residues using the TRR alone for poultry are summarized in Table 10. The chronic anticipated residues using the TRR alone for poultry are summarized in Table 11.

Table 10. Summary of TRR characterized/identified in tissues of laying hens orally dosed with ¹⁴C-Lindane at 120 ppm (2700x acute dietary burden) normalized to 1x the acute dietary burden.

Tissue	Total Radioactive Residue (TRR) ppm	Acute Anticipated Residue (ppm)
Fat	97.0 ppm/2700=0.04	0.04
Liver	11.7 ppm/2700=0.004	0.004
Skin	49.9 ppm/2700=0.02	0.02*
Thigh	11.8 ppm/2700=0.004	0.004
Egg White	0.21/2700=0.00008	0.00008
Egg Yolk	10.8 ppm/2700=0.004	0.004
Whole Egg		0.7(0.00008)+0.3(0.004)=0.001

*Use for poultry meat byproducts

Table 11. Summary of TRR characterized/identified in tissues of laying hens orally dosed with ¹⁴C-Lindane at 120 ppm (80000x acute dietary burden) normalized to 1x the chronic dietary burden.

Tissue	Total Radioactive Residue (TRR) ppm	Chronic Anticipated Residue (ppm)
Fat	97.0 ppm/80000=0.001	0.001
Liver	11.7 ppm/80000=0.0001	0.0001
Skin	49.9 ppm/80000=0.0006	0.0006*
Thigh	11.8 ppm/80000=0.0001	0.0001
Egg White	0.21/80000=0.000003	0.000003
Egg Yolk	10.8 ppm/80000	0.0001
Whole Egg		0.7(0.000003)+0.3(0.0001)=0.00003

*Use for poultry meat byproducts

Ruminant Feeding Study (M. Kovacs Jr., 9/20/88, RCB 4037)

Dairy cattle were fed at three feeding levels of 20 ppm (6.7x acute beef cattle dietary burden), 60 ppm (20x acute beef cattle dietary burden), and 200 ppm (67x acute beef cattle dietary burden). The exaggerated feeding rates correspond to 3.4x, 10x, and 34x for the acute dairy cattle dietary burden, respectively. The exaggerated feeding rates correspond to 450x, 1400x, and 4500x for the acute swine dietary burden, respectively. The acute anticipated residues for cattle and swine using the feeding studies along with information from the metabolism studies are summarized in Tables 12 and 13. The chronic anticipated residues for cattle and swine using the feeding studies along with information from the metabolism studies are summarized in Tables 14 and 15.

Table 12. Summary of lindane residues in cattle fed at 20, 60, and 200 ppm normalized to a 1x acute feeding level.

Sample	20 ppm (6.7x) ^a	60 ppm (20x) ^a	200 ppm (67x) ^a	Average (ppm) * (ppm TRR/ppm lindane) ^b
Milk (Day 7)	$0.41/3.4 = 0.120$	$1.64/10 = 0.164$	$3.95/34 = 0.116$	$0.133 * 1.22 = 0.163$
Liver	$0.10/6.7 = 0.015$	$0.19/20 = 0.009$	$0.72/67 = 0.011$	$0.012 * 6.25 = 0.073$
Kidney	$0.34/6.7 = 0.051$	$1.07/20 = 0.053$	$4.57/67 = 0.068$	$0.057 * 2.82 = 0.162$
Muscle	$0.97/6.7 = 0.145$	$1.80/20 = 0.090$	$8.75/67 = 0.130$	$0.122 * 1.25 = 0.152$
Fat	$11.9/6.7 = 1.78$	$20.2/20 = 1.01$	$58.1/67 = 0.87$	$1.22 * 1.18 = 1.44$

^a First number in column is residue value from feeding study which is then divided by the exaggerated feeding rate.

^b Average residue value from three feeding levels multiplied by the ratio of (ppm TRR/ppm lindane) in metabolism study.

Table 13. Summary of lindane residues in swine translated from the cattle feeding study and normalized to 1x acute feeding level.

Sample	20 ppm (450x) ^a	60 ppm (1400x) ^a	200 ppm (4500x) ^a	Average (ppm) * (ppm TRR/ppm lindane) ^b
Liver	$0.10/450=0.0002$	$0.19/1400=0.0001$	$0.72/4500= 0.0002$	$0.0002 * 6.25 = 0.001$
Kidney	$0.34/450=0.0007$	$1.07/1400=0.0008$	$4.57/4500=0.001$	$0.0008 * 2.82 = 0.002$
Muscle	$0.97/450=0.002$	$1.80/1400=0.001$	$8.75/4500=0.002$	$0.002 * 1.25 = 0.002$
Fat	$11.9/450=0.026$	$20.2/1400=0.014$	$58.1/4500=0.013$	$0.018 * 1.18 = 0.021$

^a First number in column is residue value from feeding study which is then divided by the exaggerated feeding rate.

^b Average residue value from three feeding levels multiplied by the ratio of (ppm TRR/ppm lindane) in metabolism study.

Table 14. Summary of lindane residues in cattle fed at 20, 60, and 200 ppm normalized to a 1x chronic feeding level.

Sample	20 ppm (223x) ^a	60 ppm (669x) ^a	200ppm(2230x) ^a	Average (ppm) * (ppm TRR/ppm lindane) ^b
Milk (Day 7)	0.41/113= 0.004	1.64/340=0.005	3.95/1134=0.003	0.004 * 1.22 = 0.005
Liver	0.10/223=0.0004	0.19/669=0.0003	0.72/2230=0.0003	0.0003 * 6.25 = 0.002
Kidney	0.34/223=0.002	1.07/669=0.002	4.57/2230=0.002	0.002 * 2.82 = 0.006
Muscle	0.97/223=0.004	1.80/669=0.003	8.75/2230=0.004	0.004 * 1.25 = 0.005
Fat	11.9/223=0.05	20.2/669=0.03	58.1/2230=0.03	0.04 * 1.18 = 0.05

^a First number in column is residue value from feeding study which is then divided by the exaggerated feeding rate.

^b Average residue value from three feeding levels multiplied by the ratio of (ppm TRR/ppm lindane) in metabolism study.

Table 15. Summary of lindane residues in swine translated from the cattle feeding study and normalized to 1x chronic feeding level.

Sample	20 ppm (13300x) ^a	60 ppm (40000x) ^a	200 ppm (133000x) ^a	Average (ppm) * (ppm TRR/ppm lindane) ^b
Liver	0.10/13300=0.000008	0.19/40000=0.000005	0.72/133000= 0.000005	0.000006 * 6.25 = 0.00004
Kidney	0.34/13300=0.00003	1.07/40000=0.00003	4.57/133000=0.00003	0.00003 * 2.82 = 0.00008
Muscle	0.97/13300=0.00007	1.80/40000=0.00005	8.75/133000=0.00007	0.00006 * 1.25 = 0.00008
Fat	11.9/13300=0.0009	20.2/40000=0.0005	58.1/133000=0.0004	0.0006 * 1.18 = 0.0007

^a First number in column is residue value from feeding study which is then divided by the exaggerated feeding rate.

^b Average residue value from three feeding levels multiplied by the ratio of (ppm TRR/ppm lindane) in metabolism study.

Poultry Feeding Study (G. Otakie, 8/31/88, RCB 4034)

Poultry were fed lindane at 1.5 (34x the acute dietary burden), 4.5 (102x the acute dietary burden), and 15 (340x the acute dietary burden) ppm feeding levels. The acute anticipated residues for poultry using the feeding study along with information from the metabolism study are summarized in Table 16. The chronic anticipated residues for poultry using the feeding study along with information from the metabolism study are summarized in Table 17.

Table 16. Summary of lindane residues in poultry fed at 1.5, 4.5, and 15 ppm normalized to a 1x acute feeding level.

Sample	1.5 ppm (34x) ^a	4.5 ppm (102x) ^a	15 ppm (340x) ^a	Average (ppm) * (ppm TRR/ppm lindane) ^b
Eggs	0.216/34 = 0.006	0.672/102 = 0.006	2.357/340 = 0.007	0.006 * 1.06 = 0.006

Liver	$0.12/34 = 0.003$	$0.51/102 = 0.005$	$0.78/340 = 0.002$	$0.003 * 1.95 = 0.006$
Heart	$0.33/34 = 0.010$	$0.89/102 = 0.009$	$2.26/340 = 0.007$	$0.009 * 1 = 0.009^c$
Thigh	$0.19/34 = 0.005$	$0.36/102 = 0.003$	$1.35/340 = 0.004$	$0.004 * 1.40 = 0.006$
Fat	$2.54/34 = 0.075$	$7.8/102 = 0.076$	$27.7/340 = 0.081$	$0.077 * 1.17 = 0.090$

^a First number in column is residue value from feeding study which is then divided by the exaggerated feeding rate.

^b Average residue value from three feeding levels multiplied by the ratio of (ppm TRR/ppm lindane) in metabolism study.

^c 100% of the TRR in the chicken heart was identified as lindane. This residue was used for chicken byproducts, chicken giblets (excl. liver), turkey byproducts, turkey other organ meats, and turkey giblets (excl. liver).

Table 17. Summary of lindane residues in poultry fed at 1.5, 4.5, and 15 ppm normalized to a 1x chronic feeding level.

Sample	1.5 ppm (1000x) ^a	4.5 ppm (3000x) ^a	15 ppm (10000x) ^a	Average (ppm) * (ppm TRR/ppm lindane) ^b
Eggs	$0.216/1000=0.0002$	$0.672/3000=0.0002$	$2.357/10000=0.0002$	$0.002 * 1.06 = 0.0002$
Liver	$0.12/1000=0.0001$	$0.51/3000=0.0002$	$0.78/10000=0.00008$	$0.0001 * 1.95 = 0.0002$
Heart	$0.33/1000=0.0003$	$0.89/3000=0.0003$	$2.26/10000=0.0002$	$0.0003 * 1 = 0.0003^c$
Thigh	$0.19/1000=0.0002$	$0.36/3000=0.0001$	$1.35/10000=0.0001$	$0.0001 * 1.40 = 0.0002$
Fat	$2.54/1000=0.003$	$7.8/3000=0.003$	$27.7/10000=0.003$	$0.003 * 1.17 = 0.004$

^a First number in column is residue value from feeding study which is then divided by the exaggerated feeding rate.

^b Average residue value from three feeding levels multiplied by the ratio of (ppm TRR/ppm lindane) in metabolism study.

^c 100% of the TRR in the chicken heart was identified as lindane. This residue was used for chicken byproducts, chicken giblets (excl. liver), turkey byproducts, turkey other organ meats, and turkey giblets (excl. liver).

Uncertainties

There are no adequate nature of the residue studies for plants from seed treatment application. New metabolism studies are required for three crops; however, a seed treatment metabolism study (which was classified as inadequate) was reviewed by HED and used in the determination of the TRR for use in this dietary exposure analysis. The mustard foliage TRR was translated to broccoli, Brussels sprouts, cabbage, cauliflower, radish tops, and lettuce. The wheat grain and forage TRRs were translated to barley, oats, and rye. The corn grain and forage TRRs were translated to sorghum. The nature of the residue in poultry is understood. The nature of the residue in ruminants is inadequately understood but ungradable; however the inadequacies should not affect the use of the study in these dietary exposure analyses. The magnitude of the residue studies in poultry and cattle only analyzed for lindane. The lindane residue values were derived using a ratio of total radioactive residue divided by the amount of lindane present in the metabolism studies. This would be worst case estimate since we are assuming that all of the TRR would be residues of concern.

The dietary exposure analyses using the total radioactive residues is a Tier 3 assessment since percent crop treated was used in the analyses. The dietary exposure analyses that were based on the adjustment of the lindane residues in the feeding studies is a Tier 3 assessment. Percent market share was available for all crops included in the analyses. Since lindane is registered for seed treatments only, there is no difference in the percent crop treated values between crops grown for the fresh market and those grown for processing. A processing study was available for canola only; the default DEEM™ processing factors were used for all other foods.

Results/Discussion

Estimated acute dietary exposure is below HED's level of concern for all population subgroups at the 99.9th percentile. The maximum dietary risk estimate is 16 % of the aPAD when the feeding studies were adjusted using the metabolism studies (Table 18).

Estimated chronic dietary risk is below HED's level of concern. The resulting risk estimates are 3 % of the chronic PAD (% cPAD) for the U.S. Population and 11 % of the cPAD for Children 1-6 years of age (the most highly exposed population subgroup and 6 % of the cPAD for Children 7-12 yrs. The remaining population subgroups were <5 % of the cPAD (Table 18) when the feeding studies were adjusted using the metabolism studies (Table 18).

Table 18. Estimated Acute and Chronic Dietary Exposure and Risk using the feeding studies and adjusting lindane residues using the metabolism studies.

Population Subgroup	Acute (99.9th %-ile)		Chronic	
	Exposure (mg/kg/day)	% aPAD	Exposure (mg/kg/day)	% cPAD
U.S. Population	0.001305	7	0.000054	3
All infants (<1 yr)	0.003320	17	0.000072	5
Children (1-6 yrs)	0.001973	10	0.000173.	11
Children (7-12 yrs)	0.001088	5	0.000096	6
Females (13-50 yrs)	0.000467	2	0.000034	2
Males (13-19 yrs)	0.000670	3	0.000061	4

Males (20+ yrs)	0.000458	2	0.000034	2
Seniors (55+ yrs)	0.000409	2	0.000030	2

cc : Chem F, Chron F. Morton , L. Richardson

RDI:Chemistry SAC (9/6/00); DE SAC (9/25/00) (S. Piper, 5/29/01 & D. Soderberg, 5/29/01); SVH:5/30/01

TM, Thurston Morton, Rm. 816D CM2, 305-6691, mail code 7509C

List of Attachments:

Attachment 1: Quantitative Usage Analysis, 7/17/00 (I. Yusuf, BEAD/OPP).

Attachment 2: Residue Distribution Files.

Attachment 3: Residue Information.

Attachment 4: Acute Analysis.

Attachment 5: Chronic Analysis.

Attachment 1: Quantitative Usage Analysis, 7/17/00 (I. Yusuf, BEAD/OPP).

(Registrant submission approved by BEAD)

From the Small Grains petition, Page 79.

B. Market share representing maximum percent of crop treated is 15% for field corn, 10% for canola, 1% for sweet corn, and 3% each for wheat, oats, barley, and grain sorghum.

From the Small Grains petition, Page 35

MARKET SHARE

Reasonable estimates for the percentage of seeds of wheat, barley, oats, rye, and sorghum treated with lindane *i.e.*, the market share, are 1% to 3%. The market share on corn may be as high as 15%. Market share information was used in calculations of Maximum Theoretical Dietary Burdens for livestock, and was considered in some estimations of human dietary exposure.

From the vegetables petition, Page 22.

MARKET SHARE:

Reasonable estimates for the percentage of acres employing lindane-treated seeds are: corn 15%, brassica < 1%, leafy vegetables < 1%, and radishes < 1%. (Personal Communication: T. McArtle, Trace Chemical and Seed Treatment Coalition representative, December 1998).

Attachment 2: RDFs

Documentation:doc beef fat lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,1.44

Documentation:doc beef meat lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,0.152

Documentation:doc beef meat by products lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,0.162

Documentation:doc beef liver lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,0.073

Documentation:doc milk lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,0.163

Documentation:doc poultry eggs lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,0.006

Documentation:doc poultry meat byproducts lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,0.009

Documentation:doc poultry liver lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1
15,0.006

Documentation:doc poultry giblets lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,0.009

Documentation:doc poultry fat lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,0.09

Documentation:doc poultry meat lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,0.006

Documentation:doc swine fat lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,0.021

Documentation:doc swine meat byproducts lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,0.002

Documentation:doc swine liver lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,0.001

Documentation:doc swine meat lindane
DOC ASSUMING 15% crop treated for highest feed item
TOTALZ=85
TOTALFREQ=1

15,0.002

Attachment 3: Residue Information

Acute Analysis using feeding study

Filename: C:\Deem\009001\RevAnalysis\RevacuteTRR.RS7 Chemical: Lindane
RfD(Chronic): .0016 mg/kg bw/day NOEL(Chronic): .47 mg/kg bw/day
RfD(Acute): .02 mg/kg bw/day NOEL(Acute): 6 mg/kg bw/day Q*= 1.1
Date created/last modified: 05-14-2001/06:15:23/8 Program ver. 7.72
Comment: Reference doses have 3X FQPA factored in. This is a dietary analysis using the
total radioactive residues from the plant and animal metabolism studies.

RDL indices and parameters for Monte Carlo Analysis:

Index #	Dist	Parameter #1 Code	Param #2	Param #3
1	6	beefmeat.rdf		
2	6	beeffat.rdf		

3	6	beefliver.rdf
4	6	beefmbyp.rdf
5	6	poultryegg.rdf
6	6	poultryfat.rdf
7	6	poultrygiblets.rdf
8	6	poultryliver.rdf
9	6	poultrymbyp.rdf
10	6	poultrymeat.rdf
11	6	swinefat.rdf
12	6	swineliver.rdf
13	6	swinembyrdf
14	6	swinemeat.rdf
15	6	milk.rdf

Food Code	Crop Grp	Food Name	Def Res (ppm)	Adj.Factors		RDL Pntr
				#1	#2	
265	15	Barley	0.052000	1.000	0.030	
323	M	Beef-dried	0.045000	1.920	0.150	1
324	M	Beef-fat w/o bones	0.786000	1.000	0.150	2
325	M	Beef-kidney	0.109000	1.000	0.150	4
327	M	Beef-lean (fat/free) w/o bones	0.045000	1.000	0.150	1
326	M	Beef-liver	0.511000	1.000	0.150	3
321	M	Beef-meat byproducts	0.511000	1.000	0.150	4
322	M	Beef-other organ meats	0.511000	1.000	0.150	4
168	5A	Broccoli	0.021000	1.000	0.010	
451	5A	Broccoli-chinese	0.021000	1.000	0.010	
169	5A	Brussels sprouts	0.021000	1.000	0.010	
170	5A	Cabbage-green and red	0.021000	1.000	0.010	
383	5B	Cabbage-savoy	0.021000	1.000	0.010	
301	O	Canola oil (rape seed oil)	0.002500	1.000	0.100	
171	5A	Cauliflower	0.021000	1.000	0.010	
366	P	Chicken-byproducts	0.004000	1.000	0.150	9
368	P	Chicken-fat w/o bones	0.040000	1.000	0.150	6
367	P	Chicken-giblets(liver)	0.004000	1.000	0.150	8
385	P	Chicken-giblets (excl. liver)	0.004000	1.000	0.150	7
369	P	Chicken-lean/fat free w/o bones	0.004000	1.000	0.150	10
267	15	Corn grain-bran	0.010000	1.000	0.150	
266	15	Corn grain-endosperm	0.010000	1.000	0.150	
289	15	Corn grain-oil	0.010000	1.000	0.150	
268	15	Corn grain/sugar/hfcs	0.010000	1.500	0.150	
388	15	Corn grain/sugar-molasses	0.010000	1.500	0.150	
237	15	Corn/pop	0.010000	1.000	0.150	
238	15	Corn/sweet	0.010000	1.000	0.010	
364	P	Eggs-white only	0.000080	1.000	0.150	5
363	P	Eggs-whole	0.001000	1.000	0.150	5
365	P	Eggs-yolk only	0.004000	1.000	0.150	5
330	M	Goat-fat w/o bone	0.786000	1.000	0.150	2
331	M	Goat-kidney	0.109000	1.000	0.150	4
333	M	Goat-lean (fat/free) w/o bone	0.045000	1.000	0.150	1
332	M	Goat-liver	0.511000	1.000	0.150	3
328	M	Goat-meat byproducts	0.511000	1.000	0.150	4
329	M	Goat-other organ meats	0.511000	1.000	0.150	4
334	M	Horsemeat	0.045000	1.000	0.150	1
182	4A	Lettuce-unspecified	0.021000	1.000	0.010	
176	4A	Lettuce-leafy varieties	0.021000	1.000	0.010	
192	4A	Lettuce-head varieties	0.021000	1.000	0.010	
398	D	Milk-based water	0.068000	1.000	0.150	15
319	D	Milk-fat solids	0.068000	1.000	0.150	15

318 D	Milk-nonfat solids	0.068000	1.000	0.150	15
320 D	Milk sugar (lactose)	0.068000	1.000	0.150	15
399 15	Oats-bran	0.052000	1.000	0.030	
269 15	Oats	0.052000	1.000	0.030	
344 M	Pork-fat w/o bone	0.012000	1.000	0.150	11
345 M	Pork-kidney	0.002000	1.000	0.150	13
347 M	Pork-lean (fat free) w/o bone	0.001000	1.000	0.150	14
346 M	Pork-liver	0.008000	1.000	0.150	12
342 M	Pork-meat byproducts	0.008000	1.000	0.150	13
343 M	Pork-other organ meats	0.008000	1.000	0.150	13
362 P	Poultry-other-fat w/o bones	0.040000	1.000	0.150	6
361 P	Poultry-other-giblets(liver)	0.004000	1.000	0.150	8
360 P	Poultry-other-lean (fat free) w/	0.004000	1.000	0.150	10
407 1AB	Radishes-japanese (daiken)	0.056000	1.000	0.010	
484 O	Radishes-oriental	0.056000	1.000	0.010	
212 1AB	Radishes-roots	0.056000	1.000	0.010	
213 2	Radishes-tops	0.021000	1.000	0.010	
274 15	Rye-flour	0.052000	1.000	0.030	
273 15	Rye-germ	0.052000	1.000	0.030	
272 15	Rye-rough	0.052000	1.000	0.030	
338 M	Sheep-fat w/o bone	0.786000	1.000	0.150	2
339 M	Sheep-kidney	0.109000	1.000	0.150	4
341 M	Sheep-lean (fat free) w/o bone	0.045000	1.000	0.150	1
340 M	Sheep-liver	0.511000	1.000	0.150	3
336 M	Sheep-meat byproducts	0.511000	1.000	0.150	4
337 M	Sheep-other organ meats	0.511000	1.000	0.150	4
275 15	Sorghum (including milo)	0.010000	1.000	0.030	
186 4A	Spinach	0.020000	1.000	0.010	
355 P	Turkey-byproducts	0.004000	1.000	0.150	9
357 P	Turkey--fat w/o bones	0.040000	1.000	0.150	6
356 P	Turkey-giblets (liver)	0.004000	1.000	0.150	8
358 P	Turkey- lean/fat free w/o bones	0.004000	1.000	0.150	10
449 P	Turkey-other organ meats	0.004000	1.000	0.150	9
429 M	Veal-dried	0.045000	1.920	0.150	1
424 M	Veal-fat w/o bones	0.786000	1.000	0.150	2
426 M	Veal-kidney	0.109000	1.000	0.150	4
425 M	Veal-lean (fat free) w/o bones	0.045000	1.000	0.150	1
427 M	Veal-liver	0.511000	1.000	0.150	3
430 M	Veal-meat byproducts	0.511000	1.000	0.150	4
428 M	Veal-other organ meats	0.511000	1.000	0.150	4
278 15	Wheat-bran	0.052000	1.000	0.030	
279 15	Wheat-flour	0.052000	1.000	0.030	
277 15	Wheat-germ	0.052000	1.000	0.030	
437 15	Wheat-germ oil	0.052000	1.000	0.030	
276 15	Wheat-rough	0.052000	1.000	0.030	

Chronic Analysis using feeding study

Filename: C:\Deem\009001\RevAnalysis\RevchronicTRR.RS7 Chemical: Lindane
 RfD(Chronic): .0016 mg/kg bw/day NOEL(Chronic): .47 mg/kg bw/day
 RfD(Acute): .02 mg/kg bw/day NOEL(Acute): 6 mg/kg bw/day Q*= 1.1
 Date created/last modified: 09-27-2000/13:05:49/8 Program ver. 7.72
 Comment: Reference doses have 3X FQPA factored in. This is the dietary analysis using the
 metabolism and feeding studies.

Food Crop			Def Res	Adj.Factors	
Code	Grp	Food Name	(ppm)	#1	#2
265	15	Barley	0.052000	1.000	0.030
323	M	Beef-dried	0.005000	1.920	1.000
324	M	Beef-fat w/o bones	0.050000	1.000	1.000
325	M	Beef-kidney	0.006000	1.000	1.000
327	M	Beef-lean (fat/free) w/o bones	0.005000	1.000	1.000
326	M	Beef-liver	0.002000	1.000	1.000
321	M	Beef-meat byproducts	0.006000	1.000	1.000
322	M	Beef-other organ meats	0.006000	1.000	1.000
168	5A	Broccoli	0.021000	1.000	0.010
451	5A	Broccoli-chinese	0.021000	1.000	0.010
169	5A	Brussels sprouts	0.021000	1.000	0.010
170	5A	Cabbage-green and red	0.021000	1.000	0.010
383	5B	Cabbage-savoy	0.021000	1.000	0.010
301	O	Canola oil (rape seed oil)	0.002500	1.000	0.100
171	5A	Cauliflower	0.021000	1.000	0.010
366	P	Chicken-byproducts	0.000300	1.000	1.000
368	P	Chicken-fat w/o bones	0.004000	1.000	1.000
367	P	Chicken-giblets(liver)	0.000200	1.000	1.000
385	P	Chicken-giblets (excl. liver)	0.000300	1.000	1.000
369	P	Chicken-lean/fat free w/o bones	0.000200	1.000	1.000
267	15	Corn grain-bran	0.010000	1.000	0.150
266	15	Corn grain-endosperm	0.010000	1.000	0.150
289	15	Corn grain-oil	0.010000	1.000	0.150
268	15	Corn grain/sugar/hfcs	0.010000	1.500	0.150
388	15	Corn grain/sugar-molasses	0.010000	1.500	0.150
237	15	Corn/pop	0.010000	1.000	0.150
238	15	Corn/sweet	0.010000	1.000	0.010
364	P	Eggs-white only	0.000200	1.000	1.000
363	P	Eggs-whole	0.000200	1.000	1.000
365	P	Eggs-yolk only	0.000200	1.000	1.000
330	M	Goat-fat w/o bone	0.050000	1.000	1.000
331	M	Goat-kidney	0.006000	1.000	1.000
333	M	Goat-lean (fat/free) w/o bone	0.005000	1.000	1.000
332	M	Goat-liver	0.002000	1.000	1.000
328	M	Goat-meat byproducts	0.006000	1.000	1.000
329	M	Goat-other organ meats	0.006000	1.000	1.000
334	M	Horsemeat	0.005000	1.000	1.000
182	4A	Lettuce-unspecified	0.021000	1.000	0.010
176	4A	Lettuce-leafy varieties	0.021000	1.000	0.010

192	4A	Lettuce-head varieties	0.021000	1.000	0.010
398	D	Milk-based water	0.005000	1.000	1.000
319	D	Milk-fat solids	0.005000	1.000	1.000
318	D	Milk-nonfat solids	0.005000	1.000	1.000
320	D	Milk sugar (lactose)	0.005000	1.000	1.000
399	15	Oats-bran	0.052000	1.000	0.030
269	15	Oats	0.052000	1.000	0.030
344	M	Pork-fat w/o bone	0.000700	1.000	1.000
345	M	Pork-kidney	0.000080	1.000	1.000
347	M	Pork-lean (fat free) w/o bone	0.000080	1.000	1.000
346	M	Pork-liver	0.000040	1.000	1.000
342	M	Pork-meat byproducts	0.000080	1.000	1.000
343	M	Pork-other organ meats	0.000080	1.000	1.000
362	P	Poultry-other-fat w/o bones	0.004000	1.000	1.000
361	P	Poultry-other-giblets(liver)	0.000200	1.000	1.000
360	P	Poultry-other-lean (fat free) w/	0.000200	1.000	1.000
407	1AB	Radishes-japanese (daiken)	0.056000	1.000	0.010
484	O	Radishes-oriental	0.056000	1.000	0.010
212	1AB	Radishes-roots	0.056000	1.000	0.010
213	2	Radishes-tops	0.021000	1.000	0.010
274	15	Rye-flour	0.052000	1.000	0.030
273	15	Rye-germ	0.052000	1.000	0.030
272	15	Rye-rough	0.052000	1.000	0.030
338	M	Sheep-fat w/o bone	0.050000	1.000	1.000
339	M	Sheep-kidney	0.006000	1.000	1.000
341	M	Sheep-lean (fat free) w/o bone	0.005000	1.000	1.000
340	M	Sheep-liver	0.002000	1.000	1.000
336	M	Sheep-meat byproducts	0.006000	1.000	1.000
337	M	Sheep-other organ meats	0.006000	1.000	1.000
275	15	Sorghum (including milo)	0.010000	1.000	0.030
186	4A	Spinach	0.020000	1.000	0.010
355	P	Turkey-byproducts	0.000300	1.000	1.000
357	P	Turkey--fat w/o bones	0.004000	1.000	1.000
356	P	Turkey-giblets (liver)	0.000200	1.000	1.000
358	P	Turkey- lean/fat free w/o bones	0.000200	1.000	1.000
449	P	Turkey-other organ meats	0.000300	1.000	1.000
429	M	Veal-dried	0.005000	1.920	1.000
424	M	Veal-fat w/o bones	0.050000	1.000	1.000
426	M	Veal-kidney	0.006000	1.000	1.000
425	M	Veal-lean (fat free) w/o bones	0.005000	1.000	1.000
427	M	Veal-liver	0.002000	1.000	1.000
430	M	Veal-meat byproducts	0.006000	1.000	1.000
428	M	Veal-other organ meats	0.006000	1.000	1.000
278	15	Wheat-bran	0.052000	1.000	0.030
279	15	Wheat-flour	0.052000	1.000	0.030
277	15	Wheat-germ	0.052000	1.000	0.030
437	15	Wheat-germ oil	0.052000	1.000	0.030
276	15	Wheat-rough	0.052000	1.000	0.030

Attachment 4: Acute Analysis

Acute Analysis Using Feeding Studies

U.S. Environmental Protection Agency Ver. 7.72
DEEM ACUTE Analysis for LINDANE (1989-92 data)
Residue file: RevacuteTRR.RS7 Adjustment factor #2 used.
Analysis Date: 05-17-2001/13:44:11 Residue file dated: 05-14-2001/06:22:07/8
NOEL (Acute) = 6.000000 mg/kg body-wt/day
Daily totals for food and foodform consumption used.
MC iterations = 5000 MC list in residue file MC seed = 10281
Run Comment: "Reference doses have 3X FQPA factored in. This is a dietary analysis using the total radioactive residues from the plant and animal metabolism studies."
=====

Summary calculations (per capita):

95th Percentile			99th Percentile			99.9th Percentile		
Exposure	% aRfD	MOE	Exposure	% aRfD	MOE	Exposure	% aRfD	MOE

U.S. Population:								
0.000160	0.80	37590	0.000516	2.58	11625	0.001305	6.53	4597
U.S. Population (spring season):								
0.000161	0.80	37345	0.000503	2.51	11932	0.001290	6.45	4649
U.S. Population (summer season):								
0.000152	0.76	39430	0.000521	2.60	11522	0.001434	7.17	4185

U.S. Population (autumn season):								
0.000166	0.83	36037	0.000563	2.82	10648	0.001294	6.47	4635
U.S. Population (winter season):								
0.000161	0.80	37331	0.000478	2.39	12539	0.001221	6.10	4914
Northeast region:								
0.000152	0.76	39450	0.000522	2.61	11504	0.001414	7.07	4242
Midwest region:								
0.000181	0.91	33091	0.000574	2.87	10451	0.001384	6.92	4336
Southern region:								
0.000151	0.76	39701	0.000457	2.29	13120	0.001106	5.53	5423
Western region:								
0.000158	0.79	37971	0.000523	2.62	11467	0.001376	6.88	4359
Hispanics:								
0.000179	0.89	33581	0.000616	3.08	9744	0.001456	7.28	4121
Non-hispanic whites:								
0.000159	0.80	37720	0.000509	2.54	11793	0.001281	6.41	4682
Non-hispanic blacks:								
0.000150	0.75	40013	0.000474	2.37	12660	0.001308	6.54	4588
Non-hisp/non-white/non-black:								
0.000158	0.79	37961	0.000592	2.96	10142	0.001594	7.97	3764
All infants:								
0.000204	1.02	29446	0.000837	4.19	7166	0.003320	16.60	1807
Nursing infants (<1 yr old):								
0.000064	0.32	94080	0.000288	1.44	20822	0.000698	3.49	8599
Non-nursing infants (<1 yr old):								
0.000234	1.17	25655	0.001521	7.60	3945	0.003626	18.13	1654
Children 1-6 yrs:								
0.000668	3.34	8986	0.001263	6.32	4748	0.001973	9.86	3041
Children 7-12 yrs:								
0.000353	1.76	17014	0.000642	3.21	9342	0.001088	5.44	5512
Females 13+ (preg/not nursing):								
0.000191	0.95	31419	0.000342	1.71	17523	0.000509	2.54	11795
Females 13+ (nursing):								
0.000148	0.74	40594	0.000353	1.76	17007	0.000623	3.12	9626
Females 13-19 (not preg or nursing):								
0.000161	0.80	37338	0.000311	1.56	19267	0.000676	3.38	8872
Females 20+ (not preg or nursing):								
0.000099	0.50	60413	0.000207	1.04	28948	0.000405	2.03	14814
Females 13-50 yrs:								
0.000111	0.55	54200	0.000246	1.23	24436	0.000467	2.34	12841
Males 13-19 yrs:								
0.000201	1.01	29835	0.000413	2.06	14540	0.000670	3.35	8958
Males 20+ yrs:								
0.000106	0.53	56386	0.000225	1.13	26639	0.000458	2.29	13101
Seniors 55+:								
0.000099	0.50	60397	0.000203	1.01	29583	0.000409	2.05	14665
Pacific:								
0.000156	0.78	38474	0.000531	2.66	11293	0.001344	6.72	4464

Attachment 5: Chronic Analysis

Chronic Analysis Using Feeding Study

U.S. Environmental Protection Agency

Ver. 7.72

DEEM Chronic analysis for LINDANE

(1989-92 data)

Residue file name: C:\Deem\009001\RevAnalysis\RevchronicTRR.RS7

Adjustment factor #2 used.

Analysis Date 05-14-2001/06:33:35

Residue file dated: 05-14-2001/06:32:18/8

Reference dose (RfD, Chronic) = .0016 mg/kg bw/day

COMMENT 1: Reference doses have 3X FQPA factored in. This is the dietary analysis using the metabolism and feeding studies and adding canola.

=====

Total exposure by population subgroup

Population Subgroup	Total Exposure	
	mg/kg body wt/day	Percent of Rfd
-----	-----	-----
U.S. Population (total)	0.000054	3.4%
U.S. Population (spring season)	0.000054	3.4%
U.S. Population (summer season)	0.000053	3.3%
U.S. Population (autumn season)	0.000056	3.5%
U.S. Population (winter season)	0.000053	3.3%
Northeast region	0.000053	3.3%
Midwest region	0.000060	3.8%
Southern region	0.000051	3.2%
Western region	0.000053	3.3%
Hispanics	0.000059	3.7%
Non-hispanic whites	0.000054	3.4%
Non-hispanic blacks	0.000049	3.1%
Non-hisp/non-white/non-black	0.000056	3.5%
All infants (< 1 year)	0.000072	4.5%
Nursing infants	0.000019	1.2%
Non-nursing infants	0.000094	5.9%
Children 1-6 yrs	0.000173	10.8%
Children 7-12 yrs	0.000096	6.0%
Females 13-19 (not preg or nursing)	0.000046	2.9%
Females 20+ (not preg or nursing)	0.000030	1.9%
Females 13-50 yrs	0.000034	2.1%
Females 13+ (preg/not nursing)	0.000049	3.0%
Females 13+ (nursing)	0.000044	2.7%
Males 13-19 yrs	0.000061	3.8%
Males 20+ yrs	0.000034	2.1%
Seniors 55+	0.000030	1.9%
Pacific Region	0.000053	3.3%
-----	-----	-----